(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 443 047 A1**

(12) **EUROPEAN PATENT APPLICATION published in accordance with Art. 158(3) EPC**

(21) Application number: **90913552.7**

(51) Int. Cl.5: **A23L 1/29**

(22) Date of filing: **13.09.90**

(86) International application number: **PCT/JP90/01173**

(87) International publication number: **WO 91/03948 (04.04.91 91/08)**

(30) Priority: **14.09.89 JP 239524/89**

(43) Date of publication of application: **28.08.91 Bulletin 91/35**

(84) Designated Contracting States: **DE FR IT NL**

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(54) **LIQUID NUTRIENT COMPOSITION.**

(57) A liquid nutrient composition and a method of production thereof, said composition comprising 3.5 to 7 g of proteins in total, 5 to 17 g of carbohydrates and 1 to 5 g of liquids in 100 ml of the whole composition, wherein 30 to 50 wt. % of the proteins comprises products of enzymatic proteolysis with molecular weights of 800 to 30,000 and 50 to 100 wt. % of the carbohydrates comprises 3 to 6 oligosaccharides, and having a viscosity of 7 cP or less at 20 °C and a gross calorific value of 70 to 130 kcal/100 ml.

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FIELD OF UTILIZATION

The present invention relates to a nutrient fluid composition, particularly a high-protein, high-calorie fluid composition containing nutrients in a good balance suited for alimentation, and a method for producing said fluid composition.

BACKGROUND TECHNOLOGY

Dietary life, particularly management of the nutritional state, is of paramount importance for maintenance of health. Omission of breakfasts and untimely lunches or suppers, for instance, not only frustrate the feeding of energy and nutrients necessary for activities of daily living but also disturb the rhythm of physiology to suppress various functions of the body, exert undue loads on the various organs and even lead to obesity which is one of the fundamental causes of adult diseases such as diabetes, hypertension, heart disease and so on. Therefore, a diversity of liquid or solid preparations containing a variety of nutrients required for activities of daily living are already available for use as supplements to meals or as sources of nutrients for quick replenishment of the energy consumed in sports and work. However, all of them have the crucial disadvantage that they are generally lean in protein. Furthermore, these nutrient preparations are not fully satisfactory, quality-wise and quantity-wise, particularly in the balance of nutrients, the ease of digestion and absorption, and nourishing value.

The object of the present invention is to provide a novel nutrient fluid composition free from the above-mentioned disadvantages of the known nutrient preparations and a method for producing said novel fluid composition.

To accomplish the above-mentioned object, the inventors of the present invention explored these and other problems in the art and found that a fluid composition having the formulational features and properties described hereinafter are quite effective in accomplishing the above-mentioned object, enables improvements in unbalanced dietary life, insures proper supply of the energy and nutrients necessary for daily activity and, as a corollary, contributes to the prophylaxis and treatment (prevention of exacerbation) of a variety of diseases due to excessive intake of energy and consequent obesity, such as diabetes, hypertension, heart disease and so on. The present invention has been conceived and developed on the basis of the above finding.

DISCLOSURE OF THE INVENTION

In accordance with the present invention, there is provided a nutrient fluid composition comprising 3.5 to 7 g of total protein, 5 to 17 g of carbohydrate and 1 to 5 g of fat in each 100 milliliters, with an enzymatically degraded protein having a molecular weight of 800 to 30,000 accounting for 30 to 50 weight percent of said total protein and an oligo(tri- to hexa-)saccharide accounting for 50 to 100 weight percent of said carbohydrate, and said composition having a viscosity [as measured with a Type B viscosimeter; the same applies hereinafter] of not more than 7 cps at 20° C and a total caloric value of 70 to 130 kcal/100 ml.

The invention further provides a method for producing the above nutrient fluid composition which comprises mixing and emulsifying the components thereof in water.

Because of the above formulation and properties, the composition of the present invention is not only easy to ingest (drink) but also provides sufficient nutrients and energy, particularly protein and calorie, on ingestion.

Moreover, the composition of the invention is well-balanced in the assortment of nutrients which, coupled with the above-mentioned protein and energy supplementation effect, produces prophylactic or aggravation-preventive effects on obesity and adult diseases. Particularly, the nutrient fluid composition of the present invention is suited for use as a breakfast food capable of providing a vital force needed for the day or as a convenient alimentation means for people with irregular eating habits, poor appetite or inability to take sufficient meals. The composition can also be utilized as a snack food for growing children and elderly persons, and even for energy supplementation after sporting exercises or as an emergency food.

The nutrient fluid composition of the present invention can be manufactured by the per se conventional procedure for production of nutrient foods of this kind except that the formulation of its components and the properties of the product are controlled as specified herein.

The protein as a component of the nutrient fluid composition of the present invention may be in the form of any known protein source only if it contains said enzymatically degraded protein in a specified proportion. The said protein source includes, among others, non-heat-coagulable proteinous materials such as casein and its salts such as casein sodium, casein calcium, etc. and enzymatic degradation products

thereof, enzymatic degradation products of soybean protein, wheat protein and so on. These protein sources can be used independently or in combination. The above-mentioned enzymatic degradation products of protein should be selected from among water-soluble proteins with molecular weights in the range of 800 to 30,000, preferably 8,000 to 30,000 and more preferably 10,000 to 15,000. As examples of such water-soluble protein, there may be mentioned enzymatically hydrolyzed gelatin (water-soluble gelatin) and enzymatically hydrolyzed casein. These degraded proteins are used in a proportion of 30 to 50 weight %, preferably 35 to 46 weight percent, of the total protein.

The molecular weight of such enzymatically degraded protein is expressed in the maximum peak value found from the molecular weight distribution and concentration distribution determined by gel filtration chromatography and SDS-PAGE, respectively.

By utilizing such enzymatic degradation-product of protein, the adverse effect of increased viscosity on the palatability of the composition can be obviated even if the total protein concentration is high. Moreover, in cases where the use of a water-soluble gelatin, for instance, might detract from the protein score, this drawback can be obviated, and a sufficient nourishing effect can be sustained, by using a high quality protein such as casein in conjunction.

The carbohydrate as a component of the nutrient fluid composition of the present invention may be any known carbohydrate source only if it contains an oligo(tri- to hexa-)saccharide in a proportion of 50 to 100 weight %, preferably 70 to 100 weight %. The carbohydrate includes, inter alia, monosaccharides, oligosaccharides and polysaccharides, such as glucose, maltose, sucrose, isomaltose, maltotriose, maltotetrose, maltopentose, maltohexose, lactose, glycogen, dextrin, starch and so on. Among the oligo(tri- to hexa-)saccharides are maltotriose, maltotetrose, maltopentose and maltohexose. Preferred are tetra- and pentasacharides, such as maltotetrose, maltopentose and so on. The use of such oligosaccharides is advantageous in that the tendency of increased osmotic pressure and excessive sweetness can be prevented.

The fat as a component of the nutrient fluid composition of the present invention may be any known fat source, whether of animal origin or of vegetable origin, such as rice oil, cottonseed oil, corn oil, soybean oil, sunflower oil, cacao butter, sesame oil, safflower oil, peanut oil, butter, lard, coconut oil, nut oil, palm oil, rapeseed oil and so on. Particularly preferred are vegetable oils.

It is essential that the nutrient fluid composition of the present invention contain said protein, carbohydrate and fat in the herein-specified proportions. Thus, these components are incorporated in proportions such that each 100 milliliter of the fluid composition will contain 3.5 to 7 g of total protein, 5 to 17 g of carbohydrate and 1 to 5 g of fat and preferably 4.5 to 7 g of total protein, 10 to 16 g of carbohydrate and 2 to 3 g of fat.

Where necessary, the nutrient fluid composition of the present invention may further contain a variety of additives which are commonly employed. Among such additives are various vitamins (e.g. vitamin A, vitamin B_1, vitamin B_2, vitamin B_6, vitamin B_{12}, vitamin C, vitamin D, vitamin E, niacin, folic acid, pantothenic acid, etc.), various minerals (e.g. calcium, iron, potassium, sodium, magnesium, phosphorus, chlorine and other salts), various flavors such as synthetic and natural flavors, sweeteners inclusive of natural sweeteners (thaumatin, stevia, etc.) and synthetic sweeteners (saccharin, cyclamate, etc.), colors, emulsifiers, stabilizers, preservatives and so on. These additives can be used singly or in combination.

The composition of the present invention is manufactured by mixing and emulsifying the above-mentioned components and the manufacturing process as such is not particularly limited. Generally, however, the preferred procedure comprises dissolving the water-soluble materials such as the carbohydrate and protein in water or hot water, heating the solution, then adding the liposoluble material such as the fat, and emulsifying the mixture in an appropriate homogenator.

The thus-obtained composition of the present invention is aseptically filled into suitable containers, or filled into cans, retort pouches or the like and heat-sterilized in the routine manner for marketing.

The emulsion obtained as above should have a viscosity, at 20° C, of not more than 7 cps, preferably not more than 6 cps, and for still better results, not more than 5 cps, and a caloric value of 70 to 130 kcal/100 ml. As such, the composition of the invention is of value as a high concentration, high energy turnover alimentation fluid.

The composition of the present invention is a liquid preparation which is not only rich in protein and energy and well-balanced in the assortment of nutrients as mentioned above but, after ingestion, is efficiently decomposed (digested) and absorbed from the testinal tract and constantly insures improvements in the nutritional state.

Examples

The following examples of the production of nutrient fluid compositions are further illustrative of the present invention. The protein contents of the protein sources and the sugar contents of the carbohydrate sources used in the examples are set forth below.

Protein source	Protein content (%)
Casein	87
Casein sodium	92
Casein calcium	92
Enzymatically degraded casein	92
Enzymatically degraded soybean	92
Enzymatically degraded gelatin	95

Carbohydrate source	Sugar content (%)
Dextrin*	67
Maltotetrose syrup	75
Maltotriose syrup	75
Maltose syrup	75

The dextrin* contains tri- to hexa-saccharides in a proportion of 50 weight % of total carbohydrate.

Example 1

The component materials in amounts (g/100ml) sufficient to give the compositions shown in Table 1 were mixed and emulsified in water. The resulting nutrient fluid compositions of the present invention were respectively filled into containers and heat-sterilized.

Table 1

Formulation No.	1	2	3	4	5
Protein (g/100 ml)	5.2	6.8	5.7	5.0	5.6
Carbohydrate (g/100 ml)	15.0	15.5	11.9	12.6	9.8
Fat (g/100 ml)	2.2	2.3	2.2	2.2	2.1
Energy (kcal)	100	110	90	90	80
Protein composition					
Casein	3.3	4.5	-	-	-
Casein sodium	-	-	2.2	2.6	3.3
Casein calcium	-	-	1.1	0.6	-
Enzymatically degraded casein	-	-	0.7	2.2	-
Enzymatically degraded soybean protein	-	-	0.2	-	0.5
Enzymatically degraded gelatin	2.5	3.1	2.0	-	2.2
Sugar composition					
Dextrin	-	-	8.4	-	-
Maltotetrose syrup	20.0	14.9	-	10.3	-
Maltotriose syrup	-	5.8	8.4	-	13.1
Maltose syrup	-	-	-	6.5	-
Fat composition					
Soybean oil	2.0	-	-	-	-
Rice oil	-	2.3	-	1.2	-
Cottonseed oil	-	-	2.2	-	1.5
Peanut oil	-	-	-	1.0	-
Macadamia nut oil	2.0	-	-	-	0.6
Other components					
Vitamins	q.s.	q.s.	q.s.	q.s.	q.s.
Minerals	q.s.	q.s.	q.s.	q.s.	q.s.
Flavor	q.s.	q.s.	q.s.	q.s.	q.s.

Table 1 (Continued)

Formulation No.	6	7	8	9	10
Protein (g/100 ml)	6.9	5.0	3.5	5.1	5.0
Carbohydrate (g/100 ml)	8.0	8.7	17.0	12.6	8.7
Fat (g/100 ml)	3.4	1.7	2.0	2.2	1.7
Energy (kcal)	90	70	100	90	70
Protein composition					
Casein	-	-	-	-	-
Casein sodium	4.0	2.9	2.6	3.2	3.3
Casein calcium	-	-	-	-	-
Enzymatically degraded casein	0.6	0.4	1.2	-	-
Enzymatically degraded soybean protein	0.2	-	-	0.3	-
Enzymatically degraded gelatin	2.6	2.1	-	2.0	2.1
Sugar composition					
Dextrin	3.1	-	-	-	13.0
Maltotetrose syrup	-	6.0	22.7	16.8	-
Maltotriose syrup	8.0	-	-	-	-
Maltose syrup	-	5.6	-	-	-
Fat composition					
Soybean oil	2.4	-	-	2.3	-
Rice oil	1.0	1.0	2.0	-	-
Cottonseed oil	-	-	-	-	1.7
Peanut oil	-	-	-	-	-
Macadamia nut oil	-	0.7	-	-	-
Other components					
Vitamins	q.s.	q.s.	q.s.	q.s.	q.s.
Minerals	q.s.	q.s.	q.s.	q.s.	q.s.
Flavor	q.s.	q.s.	q.s.	q.s.	q.s.

Th above nutrient fluid compositions of the present invention were rich in protein and energy and well-balanced in nutrients and insured an improving effect on the nutritional state.

Claims

1. A nutrient fluid composition comprising 3.5 to 7 g of total protein, 5 to 17 g of carbohydrate and 1 to 5 g of fat in each 100 milliliters, with an enzymatically degraded protein having a molecular weight of 800 to 30,000 accounting for 30 to 50 weight percent of said total protein and an oligo(tri- to hexa-

)saccharide accounting for 50 to 100 weight percent of said carbohydrate, and said composition having a viscosity of not more than 7 cps at 20° C and a total caloric value of 70 to 130 kcal/100 ml.

2. The composition of claim 1 which contains 4.5 to 7 g of total protein, 10 to 16 g of carbohydrate and 2 to 3 g of fat in each 100 milliliters.

3. The composition of claim 1 wherein said water-soluble protein having a molecular weight of 8,000 to 30,000 accounts for 35 to 46 weight percent of said total protein and one or more oligosaccharides selected from the group consisting of maltotriose, maltotetrose, maltopentose and maltohexose accounting for 70 to 100 weight percent of said carbohydrate.

4. The composition of claim 3 wherein said water-soluble protein has a molecular weight in the range of 10,000 to 15,000 and said carbohydrate is one or more oligo(tetra-/penta-)saccharides selected from the group consisting of maltotetrose and maltopentose.

5. The composition of claim 1 which contains 4.5 to 7 g of total protein, 10 to 16 g of carbohydrate, and 2 to 3 g of fat in each 100 milliliters and in which said water-soluble protein having a molecular weight of 8,000 to 30,000 accounts for 35 to 46 weight percent of said total protein and one or more oligosaccharides selected from the group consisting of maltotriose, maltotetrose, maltopentose and maltohexose account for 70 to 100 weight percent of said carbohydrate.

6. The composition of claim 1 which contains 4.5 to 7 g of total protein, 10 to 16 g of carbohydrate and 2 to 3 g of fat in each 100 milliliters and in which a water-soluble protein having a molecular weight in the range of 10,000 to 15,000 accounts for 35 to 46 weight percent of said total protein and one or more oligo(tetra/penta-)saccharides selected from the group consisting of maltoterose and maltopentose account for 70 to 100 weight percent of said carbohydrate.

7. The composition of claim 5 which has a viscosity of not more than 5 cps at 20° C.

8. The composition of claim 6 which has a viscosity of not more than 5 cps at 20° C.

9. The composition of any of claims 1 through 8 wherein said protein is selected from among non-heat-coagulable proteinous materials and said carbohydrate is selected from the group consisting of glucose, maltose, sucrose, isomaltose, maltotriose, maltotetrose, maltopentose, maltohexose, lactose, glycogen, dextrin and starch, and said fat is selected from the group consisting of rice oil, cottonseed oil, corn oil, soybean oil, sunflower oil, cacao butter, sesame oil, safflower oil, peanut oil, butter, lard, coconut oil, nut oil, palm oil and rapeseed oil.

10. The composition of any of claims 1 through 8 wherein said protein is selected from the group consisting of casein, casein sodium, casein calcium, enzymatic degradation products of said caseins, enzymatically degraded soybean protein, enzymatically degraded wheat protein and enzymatically degraded gelatin, said carbohydrate is selected from the group consisting of oligo(tetra-/penta-)saccharides, and said fat is selected from the group consisting of vegetable oils.

11. The composition of claim 10 wherein said oligosaccharide is maltotetrose and/or maltopentose.

12. The composition of claim 7 or 8 wherein said protein is selected from the group consisting of casein, casein sodium, casein calcium, enzymatically degraded casein, enzymatically degraded soybean protein and enzymatically degraded gelatin, said carbohydrate is selected from the group consisting of dextrin, maltotetrose syrup, maltotriose syrup and maltose syrup, and said fat is selected from the group consisting of soybean oil, rice oil, cottonseed oil, peanut oil and macadamia nut oil.

13. A method of producing a nutrient fluid composition which comprises providing a protein source containing 30 to 50 weight percent of an enzymatically degraded protein having a molecular weight in the range of 800 to 30,000 and a carbohydrate source containing 50 to 100 weight percent of an oligo-(tri- to hexa-)saccharide, and a fat source and mixing and emulsifying said sources in water to give a fluid composition containing 3.5 to 7 g of total protein, 5 to 17 g of carbohydrate and 1 to 5 g of fat in each 100 milliliters, having a viscosity, at 20° C, of not more than 7 cps and a total caloric value of 70

to 130 kcal/100 ml.

INTERNATIONAL SEARCH REPORT

International Application No PCT/JP90/01173

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl[5] A23L1/29

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	A23L1/29, 1/30, 1/305, 1/48

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

Jitsuyo Shinan Koho	1945 - 1990
Kokai Jitsuyo Shinan Koho	1971 - 1990

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	JP, B2, 63-42510 (Nippon Oil and Fats Co., Ltd.), August 24, 1988 (24. 08. 88), (Family: none)	1-13
P	JP, A, 1-240169 (Nippon Oil and Fats Co., Ltd. and another), September 25, 1989 (25. 09. 89), (Family: none)	1-13

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
December 10, 1990 (10. 12. 90)	December 25, 1990 (25. 12. 90)
International Searching Authority	**Signature of Authorized Officer**
Japanese Patent Office	

Form PCT/ISA/210 (second sheet) (January 1985)